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April 14, 1999

VIA HAND DELIVERY

Ms. Magalie R. Salas
Secretary
Federal Communications Commission
The Portals, 445 Twelfth Street, S.W.
Washington, D.C.

Re: ET Docket No. 98-206, RM-9147, RM-9245

Dear Ms. Salas:

Enclosed please find for filing on behalf of EchoStar Communications Corporation ("EchoStar") an original and eight copies of EchoStar's Reply Comments in the above-referenced proceeding. Pursuant to the Commission's request, EchoStar submits these Reply Comments in both hard copy and on computer disk.

Also enclosed is an additional copy of EchoStar's Reply Comments, which we ask you to date stamp and return with our messenger.

Respectfully submitted,

Colleen Sechrest

Philip L. Malet
Pantelis Michalopoulos
Colleen A. Sechrest

Enclosures

No. of Copies rec'd 0+8
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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matters of	)	
Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range	)	ET Docket No. 98-206 RM-9147 RM-9245
and	)	
Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates	)	

REPLY COMMENTS OF ECHOSTAR COMMUNICATIONS CORPORATION

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Counsel for EchoStar Communications Corporation

Dated: April 14, 1999

SUMMARY

EchoStar Communications Corporation ("EchoStar") hereby submits its reply comments on the Commission's proposals (1) to permit non-geostationary satellite orbit ("NGSO") Fixed-Satellite Service ("FSS") operations in certain segments of the Ku-band; and (2) to permit terrestrial use of the 12.2-12.7 GHz band for the retransmission of local television and the provision of one-way data services on a secondary basis by Direct Broadcast Satellite ("DBS") service operators and their affiliates. As is overwhelming clear from the vast majority of comments already filed in these proceedings, the Commission must proceed cautiously before allocating any spectrum in the Ku-band to NGSO FSS and must not, under any circumstances, allocate any spectrum in the 12.2-12.7 GHz band to any point-to-multipoint terrestrial service.

With respect to NGSO FSS, at this time there simply is not agreement, either within the United States or internationally, on the appropriate sharing criteria for allowing NGSO FSS systems to operate co-frequency with DBS and FSS services in the Ku-band. The Commission should proceed with this proposed new satellite allocation only if it can be conclusively established that NGSO FSS systems will not cause unacceptable interference to existing satellite operations and their customers. To this end, the Commission must **not** establish sharing criteria based on the WRC-97 provisional NGSO FSS power limits, but rather should await the outcome of WRC-2000 and the resolution of the many outstanding regulatory and technical issues before establishing sharing criteria.

In addition, EchoStar agrees that the Commission should require NGSO FSS proponents to demonstrate the operational integrity of their systems before they are licensed, thereby assuring GSO operators that the approach to interference protection advocated by NGSO

FSS systems will work in practice as well as on paper. Moreover, EchoStar believes that strict technical and financial qualifications should be adopted to limit the number of NGSO FSS systems ultimately licensed. Lastly, EchoStar continues to believe that NGSO FSS and BSS cannot co-exist in the 17.3-17.8 GHz band. Thus, the Commission should affirm its tentative conclusion not to permit NGSO FSS operations in this band under any circumstances.

The record in this proceeding with respect to Northpoint's proposal is even more conclusive. The Commission must not allocate DBS spectrum to any ubiquitous terrestrial service, particularly a service such as Northpoint's, which remains ill-defined and unproven. Indeed, as the majority of the comments demonstrate, the available technical evidence strongly suggests that Northpoint's proposed service would, in fact, significantly interfere with both existing and planned DBS services.

Nor does Northpoint present a convincing rationale for putting existing DBS customers at such risk. Northpoint claims that its technology will enhance competition against cable operators by enabling DBS customers to receive local signals. At the same time, Northpoint appears to be planning a stand-alone MVPD service that would compete head-to-head with DBS and cable. Either way, ample other spectrum is available for Northpoint and others to pursue these goals, and Northpoint provides no persuasive evidence why the Commission should jeopardize the integrity of DBS – the only truly viable competitor to cable -- by re-introducing significant sources of terrestrial interference into the DBS band.

Accordingly, EchoStar urges the Commission: (1) not to allocate any Ku-band spectrum for NGSO FSS services unless or until it can be conclusively determined that existing and planned FSS and DBS services are adequately protected from interference and only on the condition that any NGSO FSS system exceeding the mandated power limits cease operations or

reduce signal strength until these limits are met; (2) not to allocate the 17.3-17.8 GHz band for any NGSO FSS use under any circumstances; and (3) to reject outright Northpoint's proposal to permit use of the DBS frequencies for a point-to-multipoint terrestrial service.

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To: The Commission

REPLY COMMENTS OF ECHOSTAR COMMUNICATIONS CORPORATION

I. INTRODUCTION

EchoStar Communications Corporation ("EchoStar") hereby submits its Reply Comments in the above-captioned proceedings.[1] As is overwhelming clear from the vast

[1] *In the Matters of Amendments of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range and Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and their Affiliates*, Notice of Proposed Rulemaking, ET Docket No. 98-206 (rel. Nov. 24, 1998)

(Continued ...)

majority of comments already filed in these proceedings, the Commission must proceed cautiously before allocating any spectrum to the non-geostationary Fixed-Satellite Service ("NGSO FSS") in the Ku-band, and must not, under any circumstances, allocate any spectrum in the 12.2-12.7 GHz band to any point-to-multipoint terrestrial service.

With respect to NGSO FSS, at this time there simply is not sufficient agreement, either within the United States or internationally, on the appropriate sharing criteria for allowing NGSO FSS systems to operate co-frequency with Direct Broadcast Satellite ("DBS") and FSS services in the Ku-band. The Commission should proceed with this proposed new satellite allocation only if it can be conclusively established that NGSO FSS systems will not cause unacceptable interference to existing satellite operations.

The record in this proceeding with respect to Northpoint's proposal is even more conclusive. The Commission must not allocate DBS spectrum to any ubiquitous terrestrial service, particularly a service such as Northpoint's, which remains ill-defined and unproven. Indeed, as the majority of the comments demonstrate, Northpoint's proposed service would, in fact, significantly interfere with both existing and planned DBS services. Given the availability of other spectrum for ubiquitous point-to-multipoint terrestrial services, there is simply no reason to jeopardize the very viability of DBS by allocating an interfering service in the same band of the spectrum.

("NPRM"). This rulemaking responds to petitions for rulemakings filed by SkyBridge, L.L.C. ("SkyBridge") and Northpoint Technology ("Northpoint"), respectively. *See* SkyBridge Petition for Rulemaking, RM-9147 (filed July 3, 1997); Northpoint Petition for Rulemaking, RM-9245 (filed March 6, 1998).

Accordingly, EchoStar urges the Commission: (1) not to allocate any Ku-band spectrum for NGSO FSS services unless or until it can be conclusively determined that existing and planned FSS and DBS services are adequately protected from interference and only on the condition that any NGSO FSS system(s) exceeding the mandated single entry and/or aggregate power limits cease operations or reduce signal strength until these limits are met; (2) not to allocate the 17.3-17.8 GHz band for any NGSO FSS use under any circumstances; and (3) to reject outright Northpoint's proposal to permit use of the DBS frequencies for a point-to-multipoint terrestrial service.

II. THE COMMISSION MUST NOT ALLOCATE NGSO FSS SPECTRUM IN THE KU-BAND UNTIL IT CAN ENSURE THAT NGSO FSS SYSTEMS WOULD NOT CAUSE UNACCEPTABLE INTERFERENCE WITH EXISTING AND PROPOSED DBS AND FSS SERVICES

The Commission must not allocate NGSO FSS spectrum in the Ku-band until it can ensure that NGSO FSS systems would not cause unacceptable interference with existing and proposed DBS and FSS operations. As the Comments of the Satellite Coalition succinctly state:

> The basic premise that NGSO FSS systems should be granted access to spectrum used by GSO FSS and BSS networks only if they can protect these networks should serve as the cornerstone of any Commission decision in this proceeding. It is the condition upon which the NGSO FSS industry has sought access to GSO FSS and BSS spectrum; it is the condition upon which WRC-97 provisionally approved NGSO FSS operations in the Ku-band; and it is the condition that the NPRM states must be satisfied in order for the Commission to authorize NGSO FSS use of encumbered spectrum.[2]

[2] Comments of the Satellite Coalition at 2. EchoStar participated in the filing of these comments.

In order to meet this fundamental condition, the Commission must **not** establish sharing criteria based on the WRC-97 provisional NGSO FSS power limits in the Ku-band. As the majority of commenters recognize, these limits are inadequate to protect both BSS and FSS operations in the Ku-band.[3] Indeed, the inadequacy of the WRC-97 provisional Ku-band limits has been recognized by the ITU-R Joint Task Group 4-9-11 ("JTG 4-9-11"), which is currently examining – and revising – these provisional limits. While the JTG 4-9-11 has made substantial progress towards establishing appropriate limits in the past 18 months, significant technical and regulatory questions must be answered before the Commission can be assured that BSS and FSS systems are adequately protected from interference.

In this regard, EchoStar also agrees with those commenters who have asserted that the Commission should require NGSO FSS proponents to demonstrate the operational integrity of their systems before they are licensed, thereby assuring GSO operators that the approach to interference protection advocated by NGSO FSS systems will work in practice as well as on paper. Additionally, EchoStar agrees with those commenters that want strict technical and financial qualification standards to limit the number of NGSO FSS systems ultimately licensed to those entities most likely to build their proposed systems. Lastly, EchoStar continues to believe that NGSO FSS and BSS cannot co-exist in the 17.3-17.8 GHz band. Thus, the

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[3] Comments of the Satellite Coalition at 2; Comments of EchoStar at 4-6; Comments of Home Box Office and Turner Broadcasting System, Inc. ("HBO") at 4-5; Comments of DIRECTV, Inc. ("DIRECTV") at 7-23; Comments of GE Americom Communications, Inc. ("GE Americom") at 10; Comments of Virtual Geosatellite, LLC ("Virtual GEO") at 13-17; Comments of Denali Telecom, L.L.C. ("Denali") at 9; Comments of Hughes Communications, Inc. ("Hughes") at 2-3; Comments of Panamsat Corporation ("Panamsat")at 4-8; Comments of Telesat Canada at 4; Comments of Loral Space & Communications Ltd. ("Loral") at 3; Comments of SBC Communications, Inc. ("SBC") at 2-5; Comments of Qualcomm Incorporation ("Qualcomm") at 2-3.

Commission should affirm its tentative conclusion not to permit NGSO FSS operations in this band under any circumstances.

A. The Provisional WRC-97 Power Limits Are Inadequate to Protect Existing and Future BSS and FSS Operations in the Ku-Band

As the vast majority of the comments submitted in this proceeding demonstrate, the provisional WRC-97 power limits proposed in the NPRM are inadequate to protect existing and future BSS and FSS operations in the Ku-band.[4] In particular, these limits would leave DBS operations in the 12 GHz band vulnerable to harmful interference from NGSO FSS systems. Such a result is unacceptable. With over six million subscribers in the United States today using the DBS bands, DBS is "the closest competitor to the cable television industry for the provision of multichannel video program distribution services."[5] This competitiveness must not be jeopardized by future NGSO FSS operations.

EchoStar does not believe that the WRC-97 provisional limits will protect the widely deployed 45 cm DBS dishes. In addition, EchoStar remains particularly concerned that the WRC-97 provisional limits, and the limits being developed by some of the interested parties in the ITU working groups, would produce unacceptable levels of interference to the larger DBS

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[4] Comments of the Satellite Coalition at 2; Comments of EchoStar at 4-6; Comments of HBO at 4-5; Comments of DIRECTV at 7-23; Comments of GE Americom at 10; Comments of Virtual GEO at 13-17; Comments of Denali at 9; Comments of Hughes at 2-3; Comments of Panamsat at 4-8; Comments of Telesat Canada at 4; Comments of Loral at 3; Comments of SBC at 2-5; Comments of Qualcomm at 2-3.

[5] NPRM, ¶ 55. As EchoStar noted in its Comments, it alone serves over 2 million subscribers from four DBS satellites operating at three orbital locations (61.5° W.L., 119° W.L., 148° W.L.) EchoStar soon will launch two additional DBS satellites at 110° W.L. if the Commission approves its proposed transaction with News Corp. and the purchase of MCI's DBS authorizations. *See* FCC File No. SAT-ASG-19981202-00093.

dishes that sometimes need to be deployed in rural and remote areas, such as Alaska and Hawaii, where DBS service is particularly valuable. Moreover, it is likely that, if adopted, these provisional power limits would hinder the evolution of DBS operations, making it difficult, if not impossible for DBS providers to introduce innovations such as EchoStar's dual-feed dish.[6] Such innovations are vital to ensure the continuing competitiveness of DBS in the MVPD marketplace, and even SkyBridge recognizes "that improved BSS service should not be stifled by the Article S22 limits."[7]

B. The Commission Must Await the Outcome of WRC 2000 Before Establishing Any Power Limits on NGSO FSS Systems in the Ku-Band

The Commission must await the outcome of WRC 2000 before establishing final Ku-band power limits in the United States. As is clear from the comments submitted in this proceeding, it is premature to act now based on either the provisional WRC-97 limits or the current work of the JTG-4-9-11, WP 4A, and WP 10-11S. While progress has been made since WRC-97 towards establishing acceptable power limits, significant issues remain which must be resolved before the Commission can be assured that GSO systems in the Ku-band are adequately protected.[8]

As DIRECTV notes, the progress to date includes establishment of appropriate protection criteria (*i.e.*, continuous epfd masks), the development of an accurate methodology to

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[6] Comments of EchoStar at 5 and Appendix C; Comments of DIRECTV at 4; Comments of GE Americom at 5.

[7] Comments of SkyBridge at 64.

[8] Comments of DIRECTV at 19-20; Comments of the Satellite Coalition at 4-5; Comments of Hughes at 3; Comments of Loral at 2; Comments of Qualcomm at 2-3.

evaluate candidate interference limits against these criteria, and a better understanding of the interference characteristics of NGSO FSS systems interacting with BSS systems.[9] In particular, EchoStar is confident that the methodology and criteria agreed to by JWP10-11S, with the modifications agreed to at the Long Beach JTG 4-9-11 meeting, for determining the appropriate epfd masks will allow the JTG 4-9-11 and the Commission to determine whether BSS operations in the Ku-band will be protected from unacceptable interference. In this regard, it is critical that all of EchoStar's links be protected, including its most sensitive links.[10] This protection must meet the JWP10-11S criteria as modified by the JTG 4-9-11, including protection from "freeze frame" events. Clearly, anything less would be unacceptable.

The comments further reflect that significant technical and regulatory issues are outstanding and must be satisfactorily answered before the Commission and EchoStar can be certain that established and planned GSO operations in the Ku-band will be adequately protected, including:

- What will the final power limits be?
- How many NGSO FSS systems will be allowed to operate on a co-frequency basis?
- What if multiple NGSO FSS systems exceed the assumptions made to establish the final power limits?
- What is the regulatory scheme to ensure that not only the single entry epfd limits are met per system, but also that the aggregate epfd levels are not exceeded?

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[9] Comments of DIRECTV at 8.

[10] The United States recently submitted to the ITU-R representative EchoStar link budgets for its most sensitive service areas. These data are attached hereto as Appendix A.

- Will the final limits fully protect existing and planned DBS and FSS services in the United States?
- What if harmful interference to DBS and FSS does occur after NGSO FSS systems are implemented?

Until all of these questions are answered with some degree of certainty, there simply is not an adequate record to act on the NPRM's proposals. EchoStar believes that many of these issues may not be satisfactorily addressed until WRC-2000.

C. The Commission Must Require NGSO FSS Applicants to Verify the Operational Integrity of their Systems Before They Are Licensed

EchoStar agrees that assert that the Commission must require NGSO FSS applicants to verify the operational integrity of their systems before they are licensed.[11] As DIRECTV points out, "[i]t is squarely the burden of NGSO system proponents to prove to the Commission and the GSO satellite industry that their systems will not harm U.S. businesses in which billions of dollars have been invested."[12] This burden has not yet been met.

The need to verify the operational integrity of NGSO FSS systems should not be underestimated. NGSO FSS advocates, such as SkyBridge, claim that they can share Ku-band frequencies with GSO operations based on their ability to maintain an exclusion zone around GSO satellites by controlling transmitters and handing off service to other satellites. As DIRECTV emphasizes, "[t]his results in existing GSO systems being completely dependent on the ability of the SkyBridge system to carry out satellite-to-satellite handoffs in a reliable and timely fashion under all traffic and propagation conditions associated with the SkyBridge

[11] Comments of DIRECTV at 22-23; Comments of Panamsat at 15-16.

[12] Comments of DIRECTV at 22.

system."[13] Given this dependency, and the billions of dollars already invested in GSO systems, it is imperative that the operational descriptions and system performance of NGSO systems be supported by hard data. Such a verification program is necessary to ensure that the complex approach to interference protection advocated by SkyBridge and other NGSO FSS proponents works in fact as well as in theory.

D. The Commission Must Require NGSO FSS Systems to Cease Operations or Reduce Signal Strength if the Final Power Limits Are Ever Exceeded

As EchoStar points out in its Comments, the Commission must explicitly require NGSO FSS operators to cease operations or reduce signal strength if their systems ever exceed the power limits ultimately placed on them.[14] In other words, interference from NGSO FSS systems would only be considered "acceptable" so long as it does not exceed the approved single entry (for each NGSO FSS system) and/or aggregate (for all NGSO FSS systems) power limits. By establishing such a rule, the Commission would provide GSO operators with some assurance that their services will not receive *any* harmful interference from NGSO FSS systems, individually or collectively.[15] Given the uncertainty that surrounds the proposed sharing criteria, and the Commission's emphasis on ensuring that both existing and future GSO services are fully protected, it is entirely appropriate for NGSO FSS systems to bear the entire burden of operating on such a basis. With respect to multiple NGSO FSS systems, the Commission will have to

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[13] Comments of DIRECTV at 22.

[14] Comments of EchoStar at 7-8.

[15] This is consistent with the terminology of the International Radio Regulations *See* Final Acts of WRC-97 at S22.2. *See also* 47 C.FR. § 2.1 (accepted interference is "[i]nterference at a higher level than defined as permissible interference . . .").

establish domestic rules and a regulatory procedure that can be included in the International Radio Regulations to ensure that the aggregate power limits are not exceeded regardless of the number of NGSO FSS systems deployed, as this is the only way to ensure adequate protection of GSO systems.

E. The Commission Should Adopt Strict Financial and Technical Qualification Standards for NGSO FSS Applicants

EchoStar also agrees with those commenters who call for strict financial and technical qualification standards for NGSO FSS applicants.[16] Such qualification standards are necessary to promote the most efficient use of scarce Ku-band spectrum,[17] and to ensure that GSO operations are adequately protected. Applications for eight NGSO FSS systems have already been filed with the FCC – far more than can be accommodated without significantly interfering with existing and planned GSO operations. By requiring applicants to meet strict technical and financial requirements, the Commission will ensure that it licenses only those operators that can successfully deploy their systems while meeting the spectrum sharing obligations that will necessarily be imposed on them.

F. The Commission Should Not Allocate the 17.3-17.8 GHz Band to NGSO FSS

The Commission should not allocate any spectrum in the 17.3-17.8 GHz band to NGSO FSS. Both SkyBridge and Virtual GEO assert that they could operate in this band

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[16] Comments of SkyBridge at 82-83 and 104-107; Comments of Boeing at 65-66; Comments of Panamsat at 26.

[17] *Id.*; NPRM, ¶ 85.

without significantly burdening BSS operations,[18] neither company has provided compelling technical evidence to support these claims, and this position is incompatible with the current understanding of the interference environment that will exist by the year 2007. In fact, existing data support the Commission's position that "spectrum sharing between ubiquitous BSS downlink to subscriber operations and NGSO FSS uplink operations, both service and gateway links, would not be possible."[19]

Use of the 17.3-17.8 GHz band by NGSO FSS (Earth-to-space) user terminals and gateways is simply not feasible in view of the international and proposed domestic allocation of that band to DBS downlinks starting in 2007. Based on the technical analyses presented in ITU-R Document 4-9-11/312, "Sharing between BSS and non-GSO FSS (Earth-to-Space) in the 17.3 to 17.8 GHz Frequency Band in Region 2," the JTG 4-9-11 concluded: (1) that because of the significant separation distances required, sharing between transmitting NGSO FSS users terminals and receive BSS user terminals is not possible; and (2) that the separation distances required between NGSO FSS gateways and BSS receivers could impose unacceptable constrains on BSS development if the number of NGSO gateways was to exceed a few per country. The JTG proposed further analysis to accurately quantify the constraints on the BSS service due to NGSO FSS gateway use of the band. However, no further analysis is needed to determine that NGSO FSS should not be permitted to operate in the 17.3-17.8 GHz band, as it is clear from the results in JTG 4-9-11 Document 312 that use of the band by NGSO FSS would adversely affect a large number of U.S. residences ***per gateway location***, and that this would significantly hinder

[18] Comments of SkyBridge at 17-21; Comments of Virtual Geo at 17.

[19] NPRM, ¶ 48.

the development of a national DBS service. This conclusion reinforces the decision of WRC-97 not to allocate the 17.3-17.8 GHz band to NGSO-FSS services in ITU Region 2. [20]

SkyBridge contends that sharing between NGSO FSS gateways and BSS user terminals would be possible if the number of gateways is small and shielding is used.[21] However, even assuming that all NGSO FSS licensees are limited to a few gateways (and assuming 3 to 5 NGSO FSS operators), there would still be many NGSO FSS gateways located across the country. This number would be increased by any foreign licensed NGSO FSS systems granted access to the United States. In addition, any NGSO FSS gateways positioned close to U.S. borders, *i.e.*, in Canada or Mexico, could severely affect the provision of DBS services in the United States. Moreover, the United States will not be able to object on interference grounds to any NGSO FSS gateway earth station filed with the ITU until 2002 when the ITU would first accept filings for BSS systems in this band.

The existence of these gateways would also significantly increase the coordination burden of DBS operators.[22] This burden would unduly and unnecessarily constrain DBS operations, particularly when viewed in light of existing allocations.[23] In particular, while NGSO FSS operations would have co-directional access to over 3 GHz of spectrum below 40 GHz in each Region, GSO BSS has access to only 1 GHz in Region 2. The 17.3-17.8 GHz band

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[20] Final Acts of the World Radiocommunication Conference Geneva 1997.

[21] Comments of SkyBridge at 20.

[22] Comments of DIRECTV at 13.

[23] Comments of Telesat Canada at 8 (agreeing that NGSO FSS and BSS sharing in the 17.3-17.8 GHz band is not possible).

is the only other band available in the near term for future BSS downlinks. Accordingly, it must not be jeopardized by a future NGSO FSS allocation.

Additionally, despite SkyBridge's claim to the contrary,[24] NGSO FSS operations in the 17.3-17.8 GHz band would appear to unacceptably interfere with the Government Radiolocation Service. Radars operating in this band employ e.i.r.p values up to 115 dBW. While such high-powered radars can co-exist with GSO systems (Earth-to-space) if the radiolocation stations limit their emissions toward the geostationary orbit, they cannot co-exist with NGSO FSS systems. This position is clearly expressed in the WRC-2000 proposal, contained in RCS 00-293, and the U.S. preliminary view, contained in RCS 00-270/1, which NTIA forwarded to the Commission. These documents state that sharing is not feasible between radiolocation stations and NGSO FSS networks and conclude that the U.S. should oppose use of the 17.3-17.8 GHz band by the NGSO FSS.

In short, NGSO FSS systems operating in the 17.3-17.8 GHz band would unduly constrain future BSS operations and would interfere with the operations of the Radiolocation Service. Accordingly, the Commission should not allocate any spectrum in this band to NGSO FSS operations.

III. THE COMMISSION MUST REJECT OUTRIGHT NORTHPOINT'S PROPOSED KU-BAND SERVICE

The Commission must reject Northpoint's proposed Ku-band service. As EchoStar and many other parties demonstrate in their comments, Northpoint's proposal to use the 12.2-12.7 GHz band for its point-to-multipoint terrestrial system would significantly interfere

[24] Comments of SkyBridge at 15-16.

with existing and planned DBS services.[25] Even Northpoint's own test results support this view, and Northpoint's Comments do not change this conclusion. In fact, as pointed out by EchoStar and others, the data submitted to date by Northpoint are riddled with errors. In the words of DIRECTV:

> Northpoint persists in blithely ignoring the fundamentals of digital broadcasting by continuing to proffer the fallacious and unsupported claim to Congress and the Commission that it can operate a point-to-multipoint terrestrial system in the same frequency band and in the same geographic area as BSS but 'not cause interference to DBS users."[26]

The Commission must not jeopardize existing and future DBS services by allowing Northpoint access to any portion of the 12 GHz spectrum even on a secondary basis.

Additionally, Northpoint does not present a convincing rationale for putting existing DBS customers at such risk. Northpoint claims that its technology will enhance competition against cable operators by enabling DBS customers to receive local signals.[27] At the same time, Northpoint appears to be planning a stand-alone MVPD service that would compete

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[25] Comments of EchoStar at 8-11; Comments of DIRECTV at 23-27; Comments of Home Box Office and Turner Broadcasting System, Inc. at 6; Comments of United States Satellite Broadcasting Company, Inc. at 4-11; Comments of Virtual Geosatellite, LLC at 26-27; Comments of Denali Telecom, L.L.C. at 13-14; Comments of the Boeing Company at 86-89; Comments of Skybridge at 110, 116.

[26] Comments of DIRECTV at 24 (*quoting* Statement of Sophia Collier, President and CEO, Northpoint Technology, Inc., before the House Commerce Subcommittee on Telecommunications, Trade and Consumer Protection (Feb. 24, 1999), at 1 ("Collier Testimony")).

[27] NPRM, ¶ 91.

head-to-head with DBS and cable.[28] Either way, ample spectrum is available in other bands for Northpoint and others to pursue these goals, and Northpoint provides no persuasive evidence why the Commission should jeopardize the integrity of DBS – the only truly viable competitor to cable -- by re-introducing significant sources of terrestrial interference into the 12 GHz band.

A. Northpoint's Proposed Service Would Interfere with Existing and Planned DBS Services

Northpoint's proposed service would significantly interfere with existing and planned DBS services. In its Comments, Northpoint claims otherwise, asserting that, "[u]ndeniably, as evidenced in the Technical Annex, Northpoint's technology will neither 1) repeatedly interrupt DBS service nor 2) cause serious degradation."[29] This sweeping statement is wholly unsupported by the facts and the technical studies conducted to date. As EchoStar and other parties demonstrate in their comments, Northpoint's limited testing indicates that its proposed system would significantly interfere with DBS operations. Indeed, as DIRECTV noted, "[s]ignal meter readings from Northpoint's Austin tests actually confirm DIRECTV's analysis that Northpoint's system will create unacceptable interference for DBS service over a majority of Northpoint's proposed service area."[30] This is no surprise, as Northpoint's tests are not only incomplete, but they are methodologically unsound. Moreover, Northpoint's proposed mitigation techniques are unproven, inconvenient, and prohibitively expensive.

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[28] Collier Testimony, at 7-8 (describing the Northpoint system as a "standalone" MVPD service that could offer its "customers dozens of cable-like channels in addition to their local stations," as well as "high speed internet services.").

[29] Comments of Northpoint at 18.

[30] Comments of DIRECTV at 26 and Technical Appendix B at 21-24.

1. Northpoint's Tests Are Incomplete and Methodologically Unsound

Northpoint's tests are incomplete and methodologically unsound in many respects.[31] **First**, all the testing contained in its Austin report examined DBS satellite reception only from satellites at 101° W.L. and 119° W.L. No interference tests were conducted for EchoStar's satellites located at 61.5° W.L. or 148° W.L. – which are at greater risk from interference due to longer path lengths directed further away from the equator.

Second, Northpoint's tests only measured one channel per location, assuming that each video channel in the combined data stream on any transponder would be equally affected. This assumption is wrong, as not all channels on any given transponder are equally degraded in the presence of interference.

Third, Northpoint claims that "most customers will have at least three directions to point their dish to pick up Northpoint's service. These multiple line-of-sight options will enable better delivery of local broadcast station signals." This is totally inconsistent with Northpoint's fundamental theory – that "a DBS antenna mounted on the side of a house with southern exposure will be blocked by the house from line-of-sight to a Northpoint transmitter."[32] Obviously, as the DBS antenna is pointed away from due south the LNBF is in the direct path of Northpoint's transmitters. Thus, harmful interference is inevitable.

Fourth, Northpoint's Austin tests only superficially examined the multipath issue -- *i.e.*, interference compounded by reflections off nearby buildings. In particular, Northpoint

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[31] Comments of EchoStar at 9-12. *See also* Comments of DIRECTV at 24-27.

[32] Comments of Northpoint at 21.

only observed a limited number of sites. Moreover, as DIRECTV observes, "Northpoint's own test data show that DIRECTV's service link availability was seriously degraded at all but one of Northpoint's test sites, in complete contradiction of Northpoint's claims."[33]

Fifth, Northpoint now claims to "deliver its services in the 12.2-12.7 GHz band through a series of low-cost cascading cells, each with a transmitter serving approximately 100 square miles."[34] If this is the case, then a DBS dish would be subject to multiple sources of interference. Northpoint never even discusses this issue, and its technical studies suggest that its tests were performed using a singular transmitter signal source.

Sixth, Northpoint's criterion for assessing interference, *i.e.*, whether such interference was "user-detectable," is inadequate. "User-detectable" implies viewing the video for break-up or loss of video. This assumes that the signal can simply be degraded until video is lost. Up until that point, any margin in the system designed to compensate for rain fade and required availability would be lost. In other words, Northpoint would essentially deprive EchoStar of all of its margins for rain fade and link availability. While Northpoint claims that its testing "was conducted under a wide variety of weather conditions ranging from clear sky to severe rain,"[35] it did not take into account the long-term, cumulative effects of its proposed system on DBS reception.[36] More specifically, because of the significant rain-fade and

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[33] Comments of DIRECTV at 26.

[34] Comments of Northpoint at 4.

[35] Comments of Northpoint at 6.

[36] Comments of DIRECTV at 27. Northpoint also makes much of the fact that "NOT A SINGLE DBS consumer called to report interference attributable to Northpoint's operation." Comments of Northpoint at 7 (emphasis in original). Yet how would the average consumer

(Continued ...)

availability margins in clear sky conditions, the Northpoint signals may not always disrupt DBS service. However, if deployed, the Northpoint system would lower these margins, thereby increasing the number and duration of downlink rain outages.[37]

Seventh, Northpoint's method of measuring signal strength degradation is flawed. Even Northpoint itself states that the proper method of measuring signal strength degradation is to turn the Northpoint transmitter on and off and compare the signal strength "deltas." Yet Northpoint inexplicably did not follow this method. Rather, it chose to measure the signal strength on adjacent unaffected EchoStar transponders, average the two measurements, and assumed, incorrectly, that this value was the level of the affected EchoStar transponder without interference present. A ratio was then calculated, also incorrectly, using the measured signal strength of the affected transponder to the averaged value already computed. Thus, not only is Northpoint's method of averaging adjacent transponder signal strength inaccurate, but the ratio calculation is inaccurate as well.

Eighth, Northpoint has made absolutely no effort to address the impact of its proposed system on the evolution of DBS service. Given that Northpoint's proposed service is likely to interfere with existing DBS services, it is equally if not more likely that its service will significantly hamper the ability of DBS providers to implement valuable innovations. For example, EchoStar expects in the near future to implement not only a dual-feed DBS dish, but also to implement a dual-band DBS/FSS dish. Such innovations are critical to EchoStar's ability

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know the difference between rain fade and interference? Moreover, the testing was conducted during the day when many consumers were likely not at home watching satellite television.

[37] Comments of DIRECTV at 27.

to provide consumers with competitive services. However, EchoStar may not be able to deploy these innovations if faced with increased interference from Northpoint's proposed system.

2. Northpoint's Proposed Mitigation Techniques Are Unproven, Inconvenient, and Prohibitively Expensive

Northpoint's proposed solutions for dealing with the interference that it will inevitably create for DBS services are unproven, inconvenient, and prohibitively expensive. More specifically, Northpoint "has an obligation to do more than merely state that interference can be eliminated by simple measures."[38] It has not fulfilled this obligation, as it has not proven the effectiveness of ***any*** of its proposed mitigation techniques. For example, Northpoint simply claims that "it is well-recognized that terrain blockage and natural shielding will fully protect the majority of DBS customers."[39] Such a conclusion may be well-recognized by Northpoint, but it is not by EchoStar or by the DBS industry. Certainly, Northpoint has not itself demonstrated that such natural shielding will protect DBS customers. Nor has Northpoint demonstrated the effectiveness of its other proposed mitigation techniques, including (1) repositioning DBS antennas; (2) replacing the standard DBS antenna with one with better rejection characteristics; (3) relocating DBS subscriber receivers away from the Northpoint transmitter's line of sight; and (4) installation of shielding -- all of which, Northpoint asserts, will prevent harmful interference from occurring.[40] Such assertions remain unproven.

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[38] Comments of United States Satellite Broadcasting Company, Inc. ("USSBC") at 10.

[39] Comments of Northpoint at 19.

[40] Comments of Northpoint at 19.

Additionally, many of Northpoint's proposed mitigation techniques are inconvenient and prohibitively expensive. As DIRECTV emphasizes, "DBS is a ubiquitously deployed, consumer-friendly service that depends in major part upon the ease of installation of DBS antennas."[41] The millions of DBS consumers do not want to reposition their antennas or receivers in the hopes of maintaining a viable signal. Nor do they want to replace their antennas with new ones designed without an offset focal point assembly. Such offset antennas can cost three to four times that of the standard 18" offset reflector and LNBF assembly.[42] Thus, the cost of replacing the antennas for even a small fraction of existing DBS customers would be prohibitively expensive. Additionally, Northpoint's suggestion of placing shielding plates around the DBS antenna to block interference is similarly inconvenient – as well as aesthetically unacceptable.

These mitigation techniques are also unacceptable in that they place the burden of mitigating interference squarely on the DBS customers' doorsteps. Section 2.104 of the Commission's Rules defines a secondary service as one which "[s]hall not cause harmful interference to stations of primary or permitted services to which frequencies are already assigned . . ."[43] Clearly, this rule implies that it is the obligation of the secondary licensee – not the primary licensee – to mitigate interference. Yet, whether they want Northpoint's proposed service or not, EchoStar's customers apparently would be forced to reposition or replace existing

[41] Comments of DIRECTV at 24.

[42] Comments of EchoStar at 10.

[43] 47 C.F.R. § 2.104(d)(4)(i).

equipment in order to continue to enjoy the high quality of reception that they have come to expect from their DBS provider. Such a result is incompatible with the Commission's Rules.

Finally, EchoStar questions Northpoint's incentive to mitigate interference in the first place. Having now decided to become a stand-alone competitor in the MVPD market, Northpoint would appear to have every incentive not to mitigate such interference as well as to dispute any claims of harmful interference raised by DBS operators or customers.[44]

In short, Northpoint has not demonstrated the effectiveness of any of its proposed mitigation techniques. Moreover, DBS subscribers should simply not be required to make costly, inconvenient adjustments to their equipment in order to accommodate an unproven secondary service – a service with very little interest in protecting DBS consumers in the first place.[45]

B. Northpoint Cannot Justify Jeopardizing Existing and Future DBS Services by Its Co-frequency Operations

Northpoint cannot justify putting existing and future DBS services at risk. When the Commission first allocated spectrum for high-power DBS services, it made the decision to relocate terrestrial microwave operations (except for a few grandfathered links),[46] based on the recognition that terrestrial point-to-point licensees simply cannot share spectrum with DBS

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[44] Comments of DIRECTV at 30.

[45] Comments of USSBC at 12.

[46] *See Inquiry Into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference*, Report and Order, 90 FCC 2d 676 (1982).

providers.[47] This fundamental incompatibility is now compounded by the potential entrance of NGSO FSS systems in the Ku-band. As discussed above, EchoStar believes that DBS and NGSO FSS systems can co-exist if appropriate sharing criteria are established. However, DBS cannot co-exist with Northpoint without suffering unacceptable levels of interference.[48] Nor is it necessary for Northpoint to do so. Given the availability of other spectrum, there is simply no reason for the Commission to reverse nearly two decades of sound spectrum management policies by reintroducing an unproven, high-density terrestrial service into the 12 GHz band. To do so would undermine the one service, DBS, that has to date proven itself to be the only viable competitor to cable.

Northpoint attempts to justify its demand for 12 GHz spectrum by asserting that this spectrum is necessary for it to provide DBS customers with the local programming they crave.[49] However, such a benefit would be cold comfort to consumers if it came at the expense of the reliability and quality that makes "DBS the closest competitor to the cable television industry for the provision of multichannel video program distribution services."[50]

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[47] *Id.* The Commission has similarly concluded that ubiquitous terrestrial and satellite services cannot share in other bands. *See e.g., Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5 – 29.5 GHz Frequency Band, to Reallocate the 29.5 – 30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services and Suite 12 Group Petition for Pioneer's Preference*, Third Notice of Proposed Rulemaking and Supplemental Tentative Decision, 11 FCC Rcd. 53, 59 (1995).

[48] NGSO FSS proponents also believes that NGSO FSS cannot share with Northpoint. Comments of SkyBridge at 111-115; Comments of Boeing at 86; Comments of Virtual GEO at 25-26.

[49] Comments of Northpoint at 14.

[50] NPRM, ¶ 55.

Additionally, rapid advances in satellite technology, such as digital compression and EchoStar's own "dual-feed" dish, are enhancing DBS operators' ability to provide more local programming directly to their customers. While there are still certain legal and technical challenges to providing DBS customers with local programming, EchoStar is confident that it will be able to provide the majority of its subscribers who want reliable local programming with satellite-delivered services in the near future.

Northpoint also contends that its use of the 12.2-12.7 GHz band will make its service less expensive to consumers, as it will be able to take advantage of existing DBS equipment.[51] However, such savings are illusory if the underlying DBS service is degraded. Moreover, any savings would evaporate if DBS customers were required to install non-offset antennas to alleviate interference problems resulting from Northpoint's services. Even more significantly, because Northpoint must provide a low-noise block down converter with the DBS receiver in order to provide its service, its choice of transmission frequency is ***not*** limited to the 12 GHz band.[52] Such a converter can readily be designed to down-convert its signals from bands already authorized for terrestrial services – without ***any*** additional cost.[53]

Additionally, EchoStar notes that Northpoint seems to have changed its emphasis from a service complementing DBS to a stand-alone MVPD competitor. Certainly, its service does not need to be compatible with DBS equipment in order to compete in the MVPD market. Northpoint can provide its service from any of the terrestrial bands already allocated by the

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[51] Comments of Northpoint at 15-16.

[52] Comments of Denali at 14; Comments of DIRECTV at 29.

[53] Comments of Denali at 14.

Commission for that purpose, including the MMDS and LMDS spectrum. Moreover, contrary to Northpoint's claims, off-the-shelf components exists in other bands which could readily be used for Northpoint's system. Indeed, Northpoint's service is simply a variant of MMDS or LMDS, and it should be required to compete on an equal footing with the applicants for those wireless services.[54]

[54] Comments of DIRECTV at 28; Comments of SkyBridge at 111; Comments of EchoStar at 14.

IV. CONCLUSION

In light of the foregoing, EchoStar urges the Commission (1) not to allocate any Ku-band spectrum for NGSO FSS services unless or until it can be conclusively determined that existing and planned DBS and FSS services are adequately protected from interference and only on condition that any NGSO FSS system that exceeds the mandated power limits cease operations or reduce signal strength until these limits are met; (2) not to allocate the 17.3-17.8 GHz band for any NGSO FSS use under any circumstances; and (3) to reject outright Northpoint's proposal to permit use of the DBS band for a point-to-multipoint terrestrial service.

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CERTIFICATION OF PERSON RESPONSIBLE
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I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this pleading, that I have either prepared or reviewed the engineering information submitted in the pleading, and that it is complete and accurate to the best of my knowledge and belief.

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Colleen Sechrest

APPENDIX A

110° W.L.

	A	B	C
1			
2	BSS Assignment characteristics		US-GSO 4C1C
3	**System Characteristics**		
4	Frequency	Freq_dw	12.450
5	Availability objective	p_tot_obj	99.750
6	Calculated availability due to rain up and downlink (Rec P 618-5)		99.767
7	Calculated availability due to rain downlink (Rec P 618-5)	p_MaxRain_dw	99.768
8	Calculated availability due to rain uplink (Rec P 618-5)	p_MaxRain_up	99.999
9	Receiver noise Bandwidth	Rx_NoiseBand	24.000
10	Modulation type	Modulation	QPSK
11	C/I due to other GSO BSS networks	CI_BSS_dw	20.000
12	C/I due to GSO FSS networks	CI_FSS_dw	99.000
13	Clear sky feeder link C/N+I	"CNI_up"	26.243
14	**C/N+I required at the freeze frame performance point of the link (2)**		5.100
15	C/N+I required at operating threshold	CNI_tot_obj	6.100
16	Total Clear sky C/N+I margin above operating threshold (1)	"CNI_tot_ClearSky_margin"	2.534
17	Available clear sky downlink atmosphere margin above threshold	AtmMargin_dw	2.720
18	Available clear sky uplink atmosphere margin above threshold	AtmMargin_up	16.691
19	C/N+I total link for 99.7% of the time	CNI_tot_03	6.355
20	C/N+I total link margin above operating threshold for 99.7% of the time	CNI_tot_margin_03	0.255
21	**Space station characteristics**		
22	Longitude	Sat_Long	-110.000
23	Satellite e.i.r.p. in the direction of the earth station	SatTx_Eirp	35.500
24	**Earth station characteristics**		
25	Receive antenna diameter	Rx_Diam	180.000
26	Receive antenna efficiency	Rx_Efficiency	69.000
27	On-axis antenna gain at antenna output	Rx_Gain	45.700
28	Off-axis antenna gain characteristics	Rx_Pattern	Fig 8, Annex 5, App 30
29	Clear sky receive system noise temperature at antenna output	Rx_Temp	85.000
30	Clear sky G/T	Rx_GsT	26.406
31	Total pointing loss	Rx_PointingLoss	0.400
32	Location of earth station	Rx_Location	Anchorage
33	Latitude	Rx_Lat	61.167
34	Longitude	Rx_Long	-149.833
35	Altitude	Rx_Alt	0.080
36	Rain climatic zone	Rx_RainZone	C
37	Elevation angle	Rx_Elev	13.270
38	**Propagation characteristics**		
39	Slant path	Rx_SlantPath	40240.530
40	Free space loss	A_Freespace_dw	206.438
41	Atmospheric absorption	A_Gaz_dw	0.200
42	Rain attenuation for 99.7% of the time	A03_dw	0.786
43	Noise increase due to atmosphere for 99.7% of the time	dRx_Temp03	2.286
44	Wanted pfd received at earth station		-128.571
45	Rain attenuation for availability percentage of time	Ap_dw	0.891
46	Noise increase due to rain for availability percentage of time	dRx_Temp	2.450
47	**Downlink budget clear sky**		
48	C/N thermal clear sky downlink	CN_dw_ClearSky	9.045
49	C/N+I clear sky downlink	CNI_dw_ClearSky	8.710
50	C/N+I clear sky total link	CNI_tot_ClearSky	8.634
51	Clear sky C/N downlink margin above operating threshold	CN_dw_ClearSky_margin	2.945
52	Clear sky C/N+I downlink margin above operating threshold	CNI_dw_ClearSky_margin	2.610
53	Clear sky C/N+I total margin above operating threshold	CNI_tot_ClearSky_margin	2.534
54	**Downlink budget 99.7% of the time**		
55	C/N thermal for 99.7% of the time, downlink	CN_dw_03	6.593
56	C/N+I for 99.7% of the time, downlink	CNI_dw_03	6.400
57	C/N margin above operating threshold for 99.7% of the time, downlink	CN_dw_03_margin	0.493
58	C/N+I margin above operating threshold for 99.7% of the time, downlink	CNI_dw_03_margin	0.300
59	**Downlink budget for availability percentage of time**		
60	C/N thermal for availability percentage of time, downlink	CN_dw	6.325
61	C/N+I for availability percentage of time, downlink	CNI_dw	6.142
62	C/N margin above operating threshold for availability percentage of the time, down	CN_dw_margin	0.225
63	C/N+I margin above operating threshold for availability percentage of the time, do	CNI_dw_margin	0.042
64	**Feeder link earth station characteristics**		
65	Frequency	Freq_up	17.550
66	Maximum uplink power control	A_Upc_up	0.000
67	Minimum feeder link earth station eirp	Tx_Eirp	80.000
68	Latitude	Tx_Lat	41.000
69	Longitude	Tx_Long	-104.000
70	Altitude	Tx_Alt	0.100
71	Rain climatic zone	Tx_RainZone	E
72	Elevation angle	Tx_Elev	42.207
73	Rain attenuation for 99.97% of the time	A003_up	4.747
74	**Characteristics of the space station receiver**		
75	Satellite receive noise temperature	SatRx_Temp	530.000
76	Satellite receive antenna gain in the direction of the feeder link station	SatRx_Gain	32.800
77	Automatic gain control setting	Sat_ALC_YN	N
78	C/I from other GSO-BSS systems	CI_BSS_up	99.000
79	C/I from other assignments in the Plan	CI_Plan_up	28.000
80	C/I from other GSO FSS systems	CI_FSS_up	99.000
81	**Uplink budget**		
82	Atmospheric absorption	A_Gaz_up	0.500
83	Slant path	Tx_SlantPath	37613.687
84	Free space loss	A_Freespace_up	208.834
85	C/N thermal clear sky	CN_up_ClearSky	31.021
86	C/N+I clear sky	CNI_up_ClearSky	26.243
87	C/N thermal uplink for 99.97% of the time	CN_up_003	26.274
88	C/N+I uplink for 99.97% of the time	CNI_up_003	21.496
89	Available clear sky uplink atmosphere margin above threshold	CNI_up_ClearSky_margin	16.691
90			
91			
92			
93	**Additional**		
94	Uplink rain fade not exceeded for 0.01% of an average year	A001_up	7.336
95	Downlink rain fade not exceeded for 0.01% of an average year	A001_dw	3.486
96			
97	(2) When the high frequency of data errors causes the MPEG decoder to cease providing full pictures		

119° W.L.

	A	B	C
1			
2	BSS Assignment characteristics		US-GSO 4B1A
3	**System Characteristics**		
4	Frequency	Freq_dw	12.450
5	Availability objective	p_tot_obj	99.750
6	Calculated availability due to rain up and downlink (Rec P 618-5)		99.760
7	Calculated availability due to rain downlink (Rec P 618-5)	p_MaxRain_dw	99.761
8	Calculated availability due to rain uplink (Rec P 618-5)	p_MaxRain_up	99.999
9	Receiver noise Bandwidth	Rx_NoiseBand	24.000
10	Modulation type	Modulation	QPSK
11	C/I due to other GSO BSS networks	CI_BSS_dw	20.000
12	C/I due to GSO FSS networks	CI_FSS_dw	99.000
13	Clear sky feeder link C/N+I	"CNI_up"	26.231
14	**C/N+I required at the freeze frame performance point of the link (2)**		5.100
15	C/N+I required at operating threshold	CNI_tot_obj	6.100
16	Total Clear sky C/N+I margin above operating threshold (1)	"CNI_tot_ClearSky_margin"	2.226
17	Available clear sky downlink atmosphere margin above threshold	AtmMargin_dw	2.384
18	Available clear sky uplink atmosphere margin above threshold	AtmMargin_up	16.267
19	C/N+I total link for 99.7% of the time	CNI_tot_03	6.303
20	C/N+I total link margin above operating threshold for 99.7% of the time	CNI_tot_margin_03	0.203
21	**Space station characteristics**		
22	Longitude	Sat_Long	-119.000
23	Satellite e.i.r.p. in the direction of the earth station	SatTx_Eirp	41.100
24	**Earth station characteristics**		
25	Receive antenna diameter	Rx_Diam	90.000
26	Receive antenna efficiency	Rx_Efficiency	69.000
27	On-axis antenna gain at antenna output	Rx_Gain	39.700
28	Off-axis antenna gain characteristics	Rx_Pattern	Fig 8, Annex 5, App 30
29	Clear sky receive system noise temperature at antenna output	Rx_Temp	85.000
30	Clear sky G/T	Rx_GsT	20.406
31	Total pointing loss	Rx_PointingLoss	0.400
32	Location of earth station	Rx_Location	Anchorage
33	Latitude	Rx_Lat	61.167
34	Longitude	Rx_Long	-149.833
35	Altitude	Rx_Alt	0.080
36	Rain climatic zone	Rx_RainZone	C
37	Elevation angle	Rx_Elev	16.106
38	**Propagation characteristics**		
39	Slant path	Rx_SlantPath	39946.984
40	Free space loss	A_Freespace_dw	206.375
41	Atmospheric absorption	A_Gaz_dw	0.200
42	Rain attenuation for 99.7% of the time	A03_dw	0.680
43	Noise increase due to atmosphere for 99.7 % of the time	dRx_Temp03	2.110
44	Wanted pfd received at earth station		-122.802
45	Rain attenuation for availability percentage of time	Ap_dw	0.760
46	Noise increase due to rain for availability percentage of time	dRx_Temp	2.244
47	**Downlink budget clear sky**		
48	C/N thermal clear sky downlink	CN_dw_ClearSky	8.708
49	C/N+I clear sky downlink	CNI_dw_ClearSky	8.397
50	C/N+I clear sky total link	CNI_tot_ClearSky	8.326
51	Clear sky C/N downlink margin above operating threshold	CN_dw_ClearSky_margin	2.608
52	Clear sky C/N+I downlink margin above operating threshold	CNI_dw_ClearSky_margin	2.297
53	Clear sky C/N+I total margin above operating threshold	CNI_tot_ClearSky_margin	2.226
54	**Downlink budget 99.7% of the time**		
55	C/N thermal for 99.7% of the time, downlink	CN_dw_03	6.539
56	C/N+I for 99.7% of the time, downlink	CNI_dw_03	6.347
57	C/N margin above operating threshold for 99.7% of the time, downlink	CN_dw_03_margin	0.439
58	C/N+I margin above operating threshold for 99.7% of the time, downlink	CNI_dw_03_margin	0.247
59	**Downlink budget for availability percentage of time**		
60	C/N thermal for availability percentage of time, downlink	CN_dw	6.325
61	C/N+I for availability percentage of time, downlink	CNI_dw	6.142
62	C/N margin above operating threshold for availability percentage of the time, down	CN_dw_margin	0.225
63	C/N+I margin above operating threshold for availability percentage of the time, do	CNI_dw_margin	0.042
64	**Feeder link earth station characteristics**		
65	Frequency	Freq_up	17.550
66	Maximum uplink power control	A_Upc_up	0.000
67	Minimum feeder link earth station eirp	Tx_Eirp	80.000
68	Latitude	Tx_Lat	41.000
69	Longitude	Tx_Long	-104.000
70	Altitude	Tx_Alt	0.100
71	Rain climatic zone	Tx_RainZone	E
72	Elevation angle	Tx_Elev	40.164
73	Rain attenuation for 99.97% of the time	A003_up	4.895
74	**Characteristics of the space station receiver**		
75	Satellite receive noise temperature	SatRx_Temp	530.000
76	Satellite receive antenna gain in the direction of the feeder link station	SatRx_Gain	32.800
77	Automatic gain control setting	Sat_ALC_YN	N
78	C/I from other GSO-BSS systems	CI_BSS_up	99.000
79	C/I from other assignments in the Plan	CI_Plan_up	28.000
80	C/I from other GSO FSS systems	CI_FSS_up	99.000
81	**Uplink budget**		
82	Atmospheric absorption	A_Gaz_up	0.500
83	Slant path	Tx_SlantPath	37767.672
84	Free space loss	A_Freespace_up	208.870
85	C/N thermal clear sky	CN_up_ClearSky	30.985
86	C/N+I clear sky	CNI_up_ClearSky	26.231
87	C/N thermal uplink for 99.97% of the time	CN_up_003	26.090
88	C/N+I uplink for 99.97% of the time	CNI_up_003	21.335
89	Available clear sky uplink atmosphere margin above threshold	CNI_up_ClearSky_margin	16.267
90			
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93	**Additional**		
94	Uplink rain fade not exceeded for 0.01% of an average year	A001_up	7.566
95	Downlink rain fade not exceeded for 0.01% of an average year	A001_dw	3.016
96			
97	(2) When the high frequency of data errors causes the MPEG decoder to cease providing full pictures		

148° W.L.

	A	B	C
1			
2	BSS Assignment characteristics		US-GSO 4A10
3	**System Characteristics**		
4	Frequency	Freq_dw	12.450
5	Availability objective	p_tot_obj	99.750
6	Calculated availability due to rain up and downlink (Rec P 618-5)		99.754
7	Calculated availability due to rain downlink (Rec P 618-5)	p_MaxRain_dw	99.757
8	Calculated availability due to rain uplink (Rec P 618-5)	p_MaxRain_up	99.997
9	Receiver noise Bandwidth	Rx_NoiseBand	24.000
10	Modulation type	Modulation	QPSK
11	C/I due to other GSO BSS networks	CI_BSS_dw	20.000
12	C/I due to GSO FSS networks	CI_FSS_dw	99.000
13	Clear sky feeder link C/N+I	"CNI_up"	26.130
14	**C/N+I required at the freeze frame performance point of the link (2)**		5.100
15	C/N+I required at operating threshold	CNI_tot_obj	6.100
16	Total Clear sky C/N+I margin above operating threshold (1)	"CNI_tot_ClearSky_margin"	2.493
17	Available clear sky downlink atmosphere margin above threshold	AtmMargin_dw	2.676
18	Available clear sky uplink atmosphere margin above threshold	AtmMargin_up	16.529
19	C/N+I total link for 99.7% of the time	CNI_tot_03	6.307
20	C/N+I total link margin above operating threshold for 99.7% of the time	CNI_tot_margin_03	0.207
21	**Space station characteristics**		
22	Longitude	Sat_Long	-148.000
23	Satellite e.i.r.p. in the direction of the earth station	SatTx_Eirp	47.000
24	**Earth station characteristics**		
25	Receive antenna diameter	Rx_Diam	45.000
26	Receive antenna efficiency	Rx_Efficiency	69.000
27	On-axis antenna gain at antenna output	Rx_Gain	33.800
28	Off-axis antenna gain characteristics	Rx_Pattern	Fig 8, Annex 5, App 30
29	Clear sky receive system noise temperature at antenna output	Rx_Temp	85.000
30	Clear sky G/T	Rx_GsT	14.506
31	Total pointing loss	Rx_PointingLoss	0.400
32	Location of earth station	Rx_Location	Seattle
33	Latitude	Rx_Lat	47.583
34	Longitude	Rx_Long	-122.333
35	Altitude	Rx_Alt	0.054
36	Rain climatic zone	Rx_RainZone	D
37	Elevation angle	Rx_Elev	29.908
38	**Propagation characteristics**		
39	Slant path	Rx_SlantPath	38619.838
40	Free space loss	A_Freespace_dw	206.081
41	Atmospheric absorption	A_Gaz_dw	0.200
42	Rain attenuation for 99.7% of the time	A03_dw	0.788
43	Noise increase due to atmosphere for 99.7 % of the time	dRx_Temp03	2.290
44	Wanted pfd received at earth station		-116.717
45	Rain attenuation for availability percentage of time	Ap_dw	0.873
46	Noise increase due to rain for availability percentage of time	dRx_Temp	2.423
47	**Downlink budget clear sky**		
48	C/N thermal clear sky downlink	CN_dw_ClearSky	9.002
49	C/N+I clear sky downlink	CNI_dw_ClearSky	8.670
50	C/N+I clear sky total link	CNI_tot_ClearSky	8.593
51	Clear sky C/N downlink margin above operating threshold	CN_dw_ClearSky_margin	2.902
52	Clear sky C/N+I downlink margin above operating threshold	CNI_dw_ClearSky_margin	2.570
53	Clear sky C/N+I total margin above operating threshold	CNI_tot_ClearSky_margin	2.493
54	**Downlink budget 99.7% of the time**		
55	C/N thermal for 99.7% of the time, downlink	CN_dw_03	6.544
56	C/N+I for 99.7% of the time, downlink	CNI_dw_03	6.352
57	C/N margin above operating threshold for 99.7% of the time, downlink	CN_dw_03_margin	0.444
58	C/N+I margin above operating threshold for 99.7% of the time, downlink	CNI_dw_03_margin	0.252
59	**Downlink budget for availability percentage of time**		
60	C/N thermal for availability percentage of time, downlink	CN_dw	6.326
61	C/N+I for availability percentage of time, downlink	CNI_dw	6.143
62	C/N margin above operating threshold for availability percentage of the time, down	CN_dw_margin	0.226
63	C/N+I margin above operating threshold for availability percentage of the time, do	CNI_dw_margin	0.043
64	**Feeder link earth station characteristics**		
65	Frequency	Freq_up	17.550
66	Maximum uplink power control	A_Upc_up	0.000
67	Minimum feeder link earth station eirp	Tx_Eirp	80.000
68	Latitude	Tx_Lat	41.000
69	Longitude	Tx_Long	-104.000
70	Altitude	Tx_Alt	0.100
71	Rain climatic zone	Tx_RainZone	E
72	Elevation angle	Tx_Elev	25.001
73	Rain attenuation for 99.97% of the time	A003_up	6.694
74	**Characteristics of the space station receiver**		
75	Satellite receive noise temperature	SatRx_Temp	530.000
76	Satellite receive antenna gain in the direction of the feeder link station	SatRx_Gain	32.800
77	Automatic gain control setting	Sat_ALC_YN	N
78	C/I from other GSO-BSS systems	CI_BSS_up	99.000
79	C/I from other assignments in the Plan	CI_Plan_up	28.000
80	C/I from other GSO FSS systems	CI_FSS_up	99.000
81	**Uplink budget**		
82	Atmospheric absorption	A_Gaz_up	0.500
83	Slant path	Tx_SlantPath	39070.324
84	Free space loss	A_Freespace_up	209.164
85	C/N thermal clear sky	CN_up_ClearSky	30.691
86	C/N+I clear sky	CNI_up_ClearSky	26.130
87	C/N thermal uplink for 99.97% of the time	CN_up_003	23.997
88	C/N+I uplink for 99.97% of the time	CNI_up_003	19.436
89	Available clear sky uplink atmosphere margin above threshold	CNI_up_ClearSky_margin	16.529
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93	**Additional**		
94	Uplink rain fade not exceeded for 0.01% of an average year	A001_up	10.346
95	Downlink rain fade not exceeded for 0.01% of an average year	A001_dw	3.498
96			
97	(2) When the high frequency of data errors causes the MPEG decoder to cease providing full pictures		

61.5° W.L.

	A	B	C
1			
2	BSS Assignment characteristics		US-GSO 4D5
3	System characteristics		
4	Frequency	Freq_dw	12.450
5	Availability objective	p_tot_obj	99.750
6	Calculated availability due to rain up and downlink (Rec P 618-5)		99.760
7	Calculated availability due to rain downlink (Rec P 618-5)	p_MaxRain_dw	99.761
8	Calculated availability due to rain uplink (Rec P 618-5)	p_MaxRain_up	99.998
9	Receiver noise Bandwidth	Rx_NoiseBand	24.000
10	Modulation type	Modulation	QPSK
11	C/I due to other GSO BSS networks	CI_BSS_dw	20.000
12	C/I due to GSO FSS networks	CI_FSS_dw	99.000
13	Clear sky feeder link C/N+I	"CNI_up"	26.137
14	C/N+I required at the freeze frame performance point of the link (2)		5.100
15	C/N+I required at operating threshold	CNI_tot_obj	6.100
16	Total Clear sky C/N+I margin above operating threshold (1)	"CNI_tot_ClearSky_margin"	6.782
17	Available clear sky downlink atmosphere margin above threshold	AtmMargin_dw	7.756
18	Available clear sky uplink atmosphere margin above threshold	AtmMargin_up	19.069
19	C/N+I total link for 99.7% of the time	CNI_tot_03	6.644
20	C/N+I total link margin above operating threshold for 99.7% of the time	CNI_tot_margin_03	0.544
21	Space station characteristics		
22	Longitude	Sat_Long	-61.500
23	Satellite e.i.r.p. in the direction of the earth station	SatTx_Eirp	51.900
24	Earth station characteristics		
25	Receive antenna diameter	Rx_Diam	45.000
26	Receive antenna efficiency	Rx_Efficiency	69.000
27	On-axis antenna gain at antenna output	Rx_Gain	33.800
28	Off-axis antenna gain characteristics	Rx_Pattern	Fig 8, Annex 5, App 30
29	Clear sky receive system noise temperature at antenna output	Rx_Temp	85.000
30	Clear sky G/T	Rx_GsT	14.506
31	Total pointing loss	Rx_PointingLoss	0.400
32	Location of earth station	Rx_Location	Houston
33	Latitude	Rx_Lat	29.833
34	Longitude	Rx_Long	-95.333
35	Altitude	Rx_Alt	0.010
36	Rain climatic zone	Rx_RainZone	M
37	Elevation angle	Rx_Elev	39.389
38	Propagation characteristics		
39	Slant path	Rx_SlantPath	37827.506
40	Free space loss	A_Freespace_dw	205.901
41	Atmospheric absorption	A_Gaz_dw	0.200
42	Rain attenuation for 99.7% of the time	A03_dw	3.232
43	Noise increase due to atmosphere for 99.7 % of the time	dRx_Temp03	4.569
44	Wanted pfd received at earth station		-114.081
45	Rain attenuation for availability percentage of time	Ap_dw	3.614
46	Noise increase due to rain for availability percentage of time	dRx_Temp	4.763
47	Downlink budget clear sky		
48	C/N thermal clear sky downlink	CN_dw_ClearSky	14.082
49	C/N+I clear sky downlink	CNI_dw_ClearSky	13.092
50	C/N+I clear sky total link	CNI_tot_ClearSky	12.882
51	Clear sky C/N downlink margin above operating threshold	CN_dw_ClearSky_margin	7.982
52	Clear sky C/N+I downlink margin above operating threshold	CNI_dw_ClearSky_margin	6.992
53	Clear sky C/N+I total margin above operating threshold	CNI_tot_ClearSky_margin	6.782
54	Downlink budget 99.7% of the time		
55	C/N thermal for 99.7% of the time, downlink	CN_dw_03	6.901
56	C/N+I for 99.7% of the time, downlink	CNI_dw_03	6.693
57	C/N margin above operating threshold for 99.7% of the time, downlink	CN_dw_03_margin	0.801
58	C/N+I margin above operating threshold for 99.7% of the time, downlink	CNI_dw_03_margin	0.593
59	Downlink budget for availability percentage of time		
60	C/N thermal for availability percentage of time, downlink	CN_dw	6.326
61	C/N+I for availability percentage of time, downlink	CNI_dw	6.143
62	C/N margin above operating threshold for availability percentage of the time, down	CN_dw_margin	0.226
63	C/N+I margin above operating threshold for availability percentage of the time, do	CNI_dw_margin	0.043
64	Feeder link earth station characteristics		
65	Frequency	Freq_up	17.550
66	Maximum uplink power control	A_Upc_up	0.000
67	Minimum feeder link earth station eirp	Tx_Eirp	80.000
68	Latitude	Tx_Lat	41.000
69	Longitude	Tx_Long	-104.000
70	Altitude	Tx_Alt	0.100
71	Rain climatic zone	Tx_RainZone	E
72	Elevation angle	Tx_Elev	25.995
73	Rain attenuation for 99.97% of the time	A003_up	6.521
74	Characteristics of the space station receiver		
75	Satellite receive noise temperature	SatRx_Temp	530.000
76	Satellite receive antenna gain in the direction of the feeder link station	SatRx_Gain	32.800
77	Automatic gain control setting	Sat_ALC_YN	N
78	C/I from other GSO-BSS systems	CI_BSS_up	99.000
79	C/I from other assignments in the Plan	CI_Plan_up	28.000
80	C/I from other GSO FSS systems	CI_FSS_up	99.000
81	Uplink budget		
82	Atmospheric absorption	A_Gaz_up	0.500
83	Slant path	Tx_SlantPath	38977.033
84	Free space loss	A_Freespace_up	209.143
85	C/N thermal clear sky	CN_up_ClearSky	30.712
86	C/N+I clear sky	CNI_up_ClearSky	26.137
87	C/N thermal uplink for 99.97% of the time	CN_up_003	24.190
88	C/N+I uplink for 99.97% of the time	CNI_up_003	19.616
89	Available clear sky uplink atmosphere margin above threshold	CNI_up_ClearSky_margin	19.069
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92			
93	Additional		
94	Uplink rain fade not exceeded for 0.01% of an average year	A001_up	10.078
95	Downlink rain fade not exceeded for 0.01% of an average year	A001_dw	14.341
96			
97	(2) When the high frequency of data errors causes the MPEG decoder to cease providing full pictures		